FULL SYLLABUS DEMO TEST : (CS) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | **SOLUTION REPORT**

ALL(65) | CORRECT(43) | INCORRECT(14) | SKIPPED(8)

Q. 11

⏱ Have any Doubt ?

Consider the following languages:

$L_1 = \{a^{2^n} | n \text{ is a positive integer}\}$
$L_2 = \{a^n b^{2n} c^n | n \geq 0\}$
$L_3 = \{a^n b^m c^{m+k} | n, m, k > 0\}$
$L_4 = \{(a^n)^m b^n | n, m \geq 1\}$

Which of the following are CORRECT?
I. L_1 is context-free but not regular.
II. L_2 is not context-free.
III. L_3 is deterministic context-free but not regular.
IV. L_4 is deterministic context-free.

A   I, III and IV only

B   II and III only   Your answer is **Correct**

Solution :
(b)
- $L_1 = \{a^{2^n} | n \text{ is a positive integer}\}$ is non CFL since non linear power is present on a.
- $L_2 = \{a^n b^{2n} c^n | n \geq 0\}$ is CSL i.e. non CFL.
- $L_3 = \{a^n b^m c^{m+k} | n, m, k > 0\}$ is DCFL because push and pop are clear and will do with single stack.
- $L_4 = \{(a^n)^m b^n | n, m \geq 1\}$
  $= \{a^{nm} b^n | n, m \geq 1\}$
  $= a^n b^n + a^{2n} b^n + a^{3n} b^n + \ldots\ldots\ldots$ i.e. infinite union of CFL is non CFL

C   I and II only

D   III and IV only

📊 QUESTION ANALYTICS   +

Q. 12

⏱ Have any Doubt ?

Which of the following problems are decidable?
P_1 : If L is a deterministic context-free language, then, is $\overline{L}$ also deterministic context-free?
P_2 : If L is a context sensitive language, then, is $\overline{L}$ also context sensitive?
P_3 : If L is a recursively enumerable, then, is $\overline{L}$ also recursively enumerable?
P_4 : If L is a recursive language, then, is $\overline{L}$ also recursive?

A   1, 2, 3, 4

B   1, 2, 4   Your answer is **Correct**

Solution :
(b)
P_1 : DCFL is closed under complement (trivially decidable). So true
P_2 : CSL is closed under complement (trivially decidable). So true
P_3 : REL is not closed under complement (Undecidable). So false
P_4 : REC is closed under complement (trivially decidable). So true

C   2, 3, 4

D   3, 4

📊 QUESTION ANALYTICS   +

Q. 13

⏱ Have any Doubt ?

Consider the following statements:

$S_1 : \{w_1 c w_2 \mid w_1, w_2 \in \{a, b\}^*, w_1 \neq w_2\}$ is regular language.

$S_2 : \{a^n b^{n+k} \mid n \geq 0, k \geq 1\} \cup \{a^{n+k} b^n \mid n \geq 0, k \geq 3\}$ is DCFL.

Which of the following is true about S_1 and S_2?

A	Only S_1 is correct	Your answer is **IN-CORRECT**

B	Only S_2 is correct	Correct Option

Solution :
(b)

$S_1 : \{w_1 c w_2 \mid w_1, w_2 \in \{a, b\}^*, w_1 \neq w_2\}$ is non-regular language, since $w_1 \neq w_2$ is done by string matching, which cannot be done by finite automata.

$S_2 : \{a^n b^{n+k} \mid n \geq 0, k \geq 1\} \cup \{a^{n+k} b^n \mid n \geq 0, k \geq 3\}$ is DCFL, since push and pop are clear.

C	Both S_1 and S_2 are correct

D	None of S_1 and S_2 is correct

📊 QUESTION ANALYTICS   +

Q. 14   💬 Have any Doubt ?   🔖

Assume that the control memory is 32 bit wide. The micro-instruction format is divided into 3 fields. A micro operation field of 14 bits specifies the micro-operations to be performed. An address selection field specifies a condition based on flags and control memory address field. There are 16 flags. How many bits are in address selection field, address field and the size of control memory in words respectively?
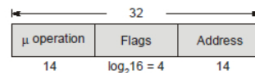
A	14 bits, 4 bits and 16384 C-Words	Your answer is **Correct**

Solution :
(a)

Control word structure:

μ operation	Flags	Address
14	$\log_2 16 = 4$	14

32

Control memory size $= 2^{14}$ control words
$= 16384$ control word

B	14 bits, 4 bits and 8192 C-Words

C	12 bits, 4 bits and 16384 C-Words

D	14 bits, 8 bits and 1024 C-Words

📊 QUESTION ANALYTICS   +

Q. 15   💬 Have any Doubt ?   🔖

A certain problem is having an algorithm with the following recurrence relation:

$$T(n) = 2T\left(\frac{n}{\sqrt{2}}\right) + n, \qquad T(1) = O(1)$$

How much time would the algorithm take to solve the problem?

A	$O(\log n)$

B	$O(n)$

C	$O(n \log n)$

D	$O(n^2)$	Your answer is **Correct**

Solution :
(d)

$$T(n) = 2T\left(\frac{n}{\sqrt{2}}\right) + n$$

Using Master's theorem, $a = 2, b = \sqrt{2}, f(n) = n$

$$n^{\log_b a} = n^{\log_{\sqrt{2}} 2} = n^2$$

$$\Rightarrow \qquad n^2 > f(n)$$

$\Rightarrow T(n)$ is $O(n^4)$

Q. 16   Have any Doubt ?   🔖

Consider the following propositional function:
$[(A \lor B) \land (\neg\{\neg A \land (\neg B \lor \neg C)\})] \lor (\neg A \land \neg B) \lor (\neg A \land \neg C)$
Which of the following is true about above function?

A   Contradiction

B   Valid   Your answer is **Correct**

Solution :
(b)
$\Rightarrow \quad [(A + B)\ ([A'\ (B' + C')]')] + (A'\ B') + (A'\ C')$
$\Rightarrow \quad [(A + B)\ [A + (B\ C)]] + (A'\ B') + (A'\ C')$
$\Rightarrow \quad [(A + B)\ (A + B)\ (A + C)] + (A'\ B') + (A'\ C')$
$$\underbrace{\frac{[(A+B)(A+C)]}{P}} + \underbrace{\frac{(A'B') + (A'C')]}{P'}}$$
$P + P' = 1$ tautology. Hence valid

C   Satisfiable

D   Contingency

Level	:	Difficult	Accuracy		Topper's Time	
			15.15%		00:00:37 hrs	
Correct Marks	:	1				
			Average Time		Your Time	
Negative Marks	:	0	01:12 min		00:02:40 hrs	

Q. 17   Have any Doubt ?   🔖

What is the main reason for occurrence of RACE condition while synchronizing the processes?

A   The two processes are trying to update the variable at the same time.

B   More than one process entering into critical section at the same time.

C   Mutual exclusion condition not satisfies.

D   All of these   Your answer is **Correct**

Solution :
(d)
Meaning of all statements (a), (b), (c) are logically same. So answer is (d).

Q. 18   Have any Doubt ?   🔖

Which of the following statement is correct?
S_1 : In simple connected undirected graph no two vertices are of same degree.
S_2 : In 3 regular graph with n vertices, the maximum vertex connectivity of a graph is 3.

A   Only S_1

B   Only S_2 Your answer is **Correct**

Solution :

(D)
According to Handshaking lemma, in simple connected undirected graph atleast two vertices are of same degree. So, statement S_1 is false.
In 3 regular graph with n vertices, minimum degree is 3 and we know that
Vertex connectivity should be ≤ minimum degree.
Vertex connectivity should be ≤ 3. So S_2 is true.

C   Both S_1 and S_2

D   None of the above

📊 QUESTION ANALYTICS   +

Q. 19   💬 Have any Doubt ?   🔖

Consider the operations:
$f(X, Y, Z) = X'Y' + XZ'$ and
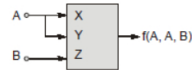$g(X, Y, Z) = XYZ' + X'Z' + XY'$
Which one of the following is correct?

A   Both {f} and {g} are functionally complete   Correct Option
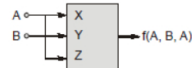
Solution :
(a)

$$f(X, Y, Z) = X'Y' + XZ'$$

$$f(A, A, B) = A \cdot A' + AB' = A' + B' = (A \cdot B)' \text{ it is NAND operation.}$$
Hence it is functionally complete.
$$g(X, Y, Z) = XYZ' + X'Z' + XY'$$

$$f(A, B, A) = ABA' + A'A' + AB' = A' + AB'$$
$$= A' + B' = (A \cdot B)' \text{ it is NAND operation.}$$
Hence it is functionally complete.

B   Only {f} is functionally complete   Your answer is IN-CORRECT

C   Only {g} is functionally complete

D   Neither {f} nor {g} is functionally complete

📊 QUESTION ANALYTICS   +

Q. 20   💬 Have any Doubt ?   🔖

If the broadcast address of the subnet is given as 163.93.63.255, which of the following mask cannot suit the above address?

A   255.255.240.0

B   255.255.248.0

C   255.255.128.0   Correct Option

Solution :
(c)
Broadcast address = 163.93.63.255
163 is class B
63.255 = 00111111.11111111
(A) 240.0 ⟹ 11110000.00000000 ⟹ 12 bits are host
(B) 248.0 ⟹ 11111000.00000000 ⟹ 11 bits are host
(C) 128.0 ⟹ 10000000.00000000 ⟹ 15 bits are host
15 bits of host remains '0's' so all 15 bits should be 1's in broadcast address, this condition is violating
So 255.255.128.0 cannot suit as mask.

D   Both (a) and (b)   Your answer is IN-CORRECT
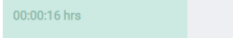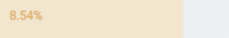
📊 QUESTION ANALYTICS   —

Level : Difficult   Accuracy   Topper's Time

Correct Marks : 0

8.54%

00:00:16 hrs

Average Time

Your Time

Negative Marks : 0.33

00:51 min

00:01:19 hrs